

WHAT IS CLAIMED IS:

1. An image observation system,
comprising:

a pair of image observation devices
5 each having i) an image pickup device, ii) an
image pickup optical system for directing light
rays from an outside world to said image pickup
device, iii) a display device for displaying an
outside world image obtained by said image pickup
10 system, and iv) a display optical system for
directing light from said display device to an
observing eye,

wherein, where an axis containing a
center of an entrance pupil of said image pickup
15 optical system and a point being conjugate with a
center of said image pickup device with respect to
said image pickup optical system is taken as an
optical axis of an image pickup system while an
axis containing a center of an exit pupil of said
20 display optical system and a point being conjugate
with a center of said display device with respect
to said display optical system is taken as an
optical axis of a display system, the optical axis
of the image pickup system and the optical axis of
25 the display system optical axis are disposed
coaxially,

wherein the optical axes of the image

pickup systems of the pair of image observation devices define a point of intersection, and

wherein a focal plane being at a position conjugate with a surface of said image pickup device with respect to said image pickup optical system is disposed at a side of the intersection point of the optical axes of the image pickup systems, which side faces an observer.

10 2. An image observation system according to Claim 1, wherein the focal plane of said image pickup optical system is fixed at a predetermined position.

15 3. An image observation system according to Claim 1, wherein the focal plane of said image pickup optical system is set at a distance not greater than 1 m from the observer's position.

20 4. An image observation system according to Claim 1, wherein a virtual image position of a center view angle of each display system, corresponding to a position conjugate with the center of the display device in the pair of image observation devices, with respect to the display optical system, is approximately coincident with
25 the intersection point of the optical axes of the

image pickup systems.

5. An image observation system according to Claim 1, wherein a virtual image position of a center view angle of each display system, corresponding to a position conjugate with the center of the display device in the pair of image observation devices, with respect to the display optical system, is at a side of the intersection point of the optical axes of the image pickup systems, which side faces the observer.

6. An image observation system according to Claim 5, wherein the distance between the virtual image position of the center view angle of the display system and the intersection point of the optical axes of the image pickup systems is not greater than 0.3 diopter.

7. An image observation system according to Claim 1, wherein said image pickup optical system has an imaging view angle being approximately equal to a display view angle of said display optical system.

8. An image observation system according to Claim 1, wherein, when the distance from an

entrance pupil of said image pickup optical system
to a focal plane of said image pickup optical
system is H , the size of the entrance pupil of
said image pickup optical system is D , the focal
5 length of said image pickup optical system is f ,
and the size of one picture element of said image
pickup device is a , the distance L from the
entrance pupil of said image pickup optical system
to the intersection point satisfies the following
10 relation:

$$L \leq [f \cdot D \cdot H] / [f \cdot D - a \cdot H]$$

9. An image observation system according
to Claim 1, wherein, when a straight line
15 perpendicular to the focal plane of said image
pickup optical system and passing through the
center of the entrance pupil of said image pickup
optical system is taken as an optical axis of said
image pickup optical system while a straight line
20 perpendicular to the virtual image plane and
passing through the center of the exit pupil of
said display optical system is taken as an optical
axis of said display optical system, the optical
axis of one image pickup optical system of the
25 pair of image pickup systems, which one is at the
outside world side, and the optical axis of one
display optical system of the pair of display

systems, which one is at the eye ball side, are parallel to each other and are spaced by an even interval, and wherein the centers of the pair of image pickup devices are disposed with a shift of
5 a predetermined distance, with respect to the optical axes of the respective image pickup optical systems, while the centers of the pair of display devices are disposed with a shift by a predetermined distance, with respect to the
10 optical axes of the respective display optical systems, whereby the point of intersection of the optical axes of the pair of image pickup systems is defined.

15 10. An image observation system according to Claim 1, wherein said image pickup optical system includes i) a prism with plural planes having a transmission function and a total reflection function, and ii) an optical element
20 disposed in a portion of an optical path between said prism and said image pickup device and having a positive optical power.

25 11. An image observation system according to Claim 1, wherein said image pickup optical system has an eccentric and non-rotationally symmetric reflection surface having an optical

power being different in accordance with an azimuth angle.

12. An image observation system according
5 to Claim 1, wherein said display optical system has an eccentric and non-rotationally symmetric reflection surface having an optical power being different in accordance with an azimuth angle.

10 13. An image observation system according to Claim 1, further comprising image creating means for producing an image and image synthesizing means for combining an image from said image creating means and an image from said
15 image pickup system so that a combined image is displayed upon said display device.

14. An image observation system according to Claim 1, wherein the entrance pupil position of
20 said image pickup optical system is disposed with a shift, toward the outside world, from the exit pupil position of said display optical system.

15 15. An image observation system according to Claim 14, wherein therein the amount of shift of the entrance pupil position of the image pickup optical system with respect to the exit pupil

position of the display optical system is not greater than 60 mm.

5

10

15

20

25